

HARD DISKS

STORE TROOPERS

Making room on your PC for all your music, images and games is a constant battle – but with one of these 24 hard disks you're sure to be victorious

INTRODUCTION

Whatever you use your PC for, be it storing music, playing games or hoarding family photos, it's all too easy to run out of hard disk space. When this happens you could trawl through your files, deleting any you don't need, but this can be risky. What if you accidentally remove some vital documents or a precious family snapshot? Fortunately, adding more hard disk space has never been easier or cheaper.

Today's hard disks come in a range of sizes, with the biggest holding a mind-boggling 750GB of data. At the other end of the scale, the cheapest can cost as little as £30. In our tests, we've found that the best bargains tend to lie in between these two extremes.

This month, we've gathered together 24 of the latest hard disks. We've tested both PATA and SATA models, from the cheapest 80GB models to the latest technology. We've put each one through a set of demanding speed tests and calculated which are the best value. Whatever you want to store, we'll help you choose the perfect disk.

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storage expert

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Choosing a... Hard Disk

With dozens of models available and confusing lists of specifications, choosing an internal hard disk can be daunting. We'll explain what you should look for, and what you can safely ignore.

MODEL BEHAVIOUR

Internal hard disks connect to your PC using either Serial ATA (SATA) or the older Parallel ATA (PATA) interface. The type you should use depends on the connectors available on your motherboard. If you have an older PC with no free SATA ports, choose a PATA disk. If you have only SATA connectors, go for a SATA model.

If your motherboard has both free SATA ports and PATA ports, you could use either. There are, however, several good reasons to choose SATA whenever possible. PATA disks use thick ribbon cables that are trickier to handle and install than the thinner cables used by SATA. What's more, the most recent version of PATA has a maximum top speed of 133MB/s, while the latest version of SATA has a maximum speed of 300MB/s. These maximum speeds are theoretical only and you're unlikely to achieve them in practice, but the best SATA disks tend to be quicker than their PATA counterparts.

STANDARDS DELIVERED

After you've decided between PATA and SATA, there are a few details to consider. If you're buying a SATA disk, you may need to check the type of SATA used by your PC. If you're using PATA on an older PC, you might need to update your PC to use the full capacity of the disk.

The original SATA standard supported speeds of up to 150MB/s. It has since been updated, with SATA II supporting speeds of up to 300MB/s. All the SATA disks in this article support SATA II and will work at this faster speed if possible.

If you have an older motherboard that supports the original SATA standard, these disks will work perfectly well at 150MB/s. In order to do this, though, some SATA II hard disks require you to set a jumper pin on the back of the disk. This tells it to operate in the slower mode. Check your computer or motherboard manual to find out whether it supports SATA or SATA II and, if it supports the older standard, make sure you change any necessary jumpers on your new disk before installing it.

If you're buying a PATA hard disk for an older PC, you may have a different problem. Some older PCs have trouble recognising PATA disks that are larger than 137GB. If you're using Windows 2000 or later, installing



the latest Service Pack and updates should solve the problem. If this doesn't work, you may need to update your motherboard's BIOS. For more information on the Windows 137GB Capacity Barrier, see <http://www.seagate.com/support/kb/disc/tp/137gb.pdf>.

POWER TRIP

It's also important to check you have a free power connector that you can connect to your new disk. PATA disks use a standard four-pin Molex power cable of the same type used by optical disk drives. Confusingly, SATA disks can support one of two types of power connector. Most use the newer SATA power connector type, which is thinner than a Molex plug. If your power supply doesn't have any SATA power plugs, you can buy a Molex-to-SATA converter for around £4 from www.maplin.co.uk; search for part code A78CX. Some SATA hard disks also include a standard Molex socket, so there's no need for an adaptor. The table on page 86 shows exactly which connectors are available on each disk.

The lower a hard disk's price per gigabyte, the more you're getting for your money. In this month's *Labs*, we found that 320GB, 400GB and 500GB hard disks usually have the lowest costs per gigabyte. Models with smaller or larger capacities don't tend to be as good value.

If you need more than 500GB of storage space but don't want to spend more money on larger but less cost-effective disks, you could join

How we test Hard disks

Our benchmarks are designed to simulate real-life tasks, giving you a realistic appraisal of how fast each disk can perform.

To test a hard disk's read and write speeds, we use an automated script to time file transfers. Files are copied from memory to the hard disk and back again. Using memory as the source ensures that any limitations on speed are caused by the disk being tested, not the source of the copy.

In our large files test, a 100MB file is copied to and from each hard disk 100 times. This shows how well a disk can cope with large files such as recorded TV programmes. Our small files test repeats the task, but with a selection of smaller files totalling 100MB. This simulates reading and writing the many small files involved in a PC backup. Finally, we test the time taken to access data on each disk using a utility called HD Tach; these speeds are listed in the tables on pages 84 and 86.

two smaller disks together in a RAID array; see *Upgrade Workshop*, *Shopper* November 2006. For the best results, you should try to use identical disks when building a RAID array. If your motherboard doesn't support RAID, RAID PCI controller cards start from as little as £30.

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PATA 3.0Gb/s 160-GB Hard Drive

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SEAGATE Barracuda 7200.10

Ultra ATA/100 250-GB Hard Drive

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SEAGATE Barracuda 7200.10

Ultra ATA/100 320-GB Hard Drive

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SEAGATE Barracuda 7200.10

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WESTERN DIGITAL Caviar WD1600BB

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WESTERN DIGITAL Caviar WD3200BB

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SATA HARD DISKS

HITACHI Deskstar T7K500 320GB

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HITACHI Deskstar T7K500 400GB

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HITACHI Deskstar T7K500 500GB

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MAXTOR DiamondMax 21

SATA 250-GB Hard Drive

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MAXTOR DiamondMax 21

SATA 320-GB Hard Drive

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SEAGATE Barracuda 7200.10

SATA 3-Gb/s 250-GB Hard Drive

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SEAGATE Barracuda 7200.10

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SEAGATE Barracuda 7200.10

SATA 3-Gb/s 750-GB Hard Drive

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WESTERN DIGITAL Caviar SE16

WD5000AAKS

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WESTERN DIGITAL Caviar SE

WD3200AAJS

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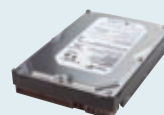
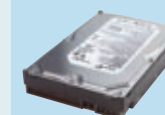


PATA HARD DISKS

BUDGET BUY

MANUFACTURER	HITACHI	HITACHI	HITACHI	SAMSUNG	SAMSUNG	SEAGATE
Model	Deskstar 7K80 80GB	Deskstar 7K160 160GB	Deskstar T7K500 500GB	SpinPoint P80-SP0842N	SpinPoint P120-SP2514N	Barracuda 7200.10 PATA 3.0Gb/s 160-GB Hard Drive
Rating	★★	★★★	★★★★	★★	★★★★★	★★★
Pros	Low purchase price	Quick small files performance; fast when reading large files	Generally good performance	Very fast at writing small files; low purchase price	Good large files performance; excellent with small files	Generally reasonable performance; long warranty
Cons	High cost per gigabyte; generally slow	Fairly high cost per gigabyte	Seagate's 500GB PATA disk is better value	Very high cost per gigabyte	Seagate's 320GB disk is cheaper per gigabyte	Slow when writing small files; fairly high cost per gigabyte
STORAGE						
Capacity	80GB	160GB	500GB	80GB	250GB	160GB
Formatted capacity (NTFS)	76GB	149GB	465GB	76GB	232GB	149GB
Price per gigabyte	£0.39	£0.28	£0.25	£0.42	£0.21	£0.29
Interface	UltraDMA 100	UltraDMA 33	UltraDMA 33	UltraDMA 100	UltraDMA 100	UltraDMA 100
Power connector	Molex	Molex	Molex	Molex	Molex	Molex
Spindle speed	7,200rpm	7,200rpm	7,200rpm	7,200rpm	7,200rpm	7,200rpm
Cache	2MB	8MB	8MB	2MB	8MB	8MB
Quoted seek time	8.8ms	8.5ms	8.5ms	8.9ms	8.9ms	12.0ms
HD Tach access time	12.9ms	14.0ms	13.2ms	15.6ms	14.6ms	14.8ms
Platters	1	1	3	1	2	1
Heads	2	2	6	2	4	2
Bearing technology	Fluid dynamic	Fluid dynamic	Fluid dynamic	Fluid dynamic	Fluid dynamic	Fluid dynamic
Noise level when idle	26dB(A)	28dB(A)	30dB(A)	30dB(A)	28dB(A)	29dB(A)
BUYING INFORMATION						
Price including VAT	£30	£42	£114	£32	£49	£43
Warranty	One year	One year	One year	Three years	Three years	Five years
Supplier	www.yoyotech.co.uk	www.lambda-tek.com	www.lambda-tek.com	www.pcnextday.co.uk	www.yoyotech.co.uk	www.yoyotech.co.uk
Details	www.hitachigst.com	www.hitachigst.com	www.hitachigst.com	www.samsung.co.uk	www.samsung.co.uk	www.seagate.com
Part code	HDS728080PLAT20	HDS721616PLAT80	HDT725050VLAT80	SP0842N	SP2514N	ST3160815A
     						

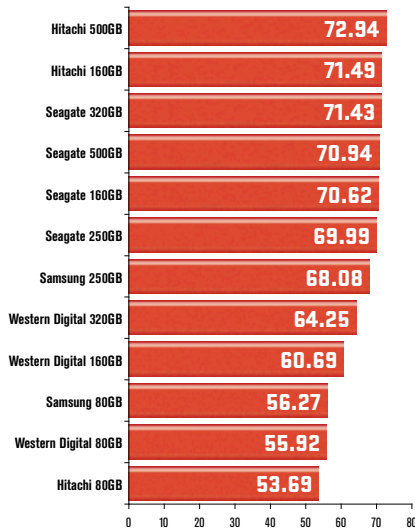
BEST BUY

MANUFACTURER	SEAGATE	SEAGATE	SEAGATE	WESTERN DIGITAL	WESTERN DIGITAL	WESTERN DIGITAL
Model	Barracuda 7200.10 Ultra ATA/100 250-GB Hard Drive	Barracuda 7200.10 Ultra ATA/100 320-GB Hard Drive	Barracuda 7200.10 Ultra ATA/100 500-GB Hard Drive	Caviar SE WD800JB	Caviar WD1600BB	Caviar WD3200BB
Rating	★★★★	★★★★★	★★★★★	★	★★	★★★
Pros	Fast when working with large files; long warranty	Very low cost per gigabyte; fast when working with large files; long warranty	Low cost per gigabyte; fast when working with large files; long warranty	Low purchase price	Fairly low purchase price	Low cost per gigabyte; respectable large file performance
Cons	Not so quick with small files	Samsung's 250GB disk is almost as cheap and faster	Not quite as quick with small files	Generally slow; very high cost per gigabyte	Generally slow; fairly high cost per gigabyte	Slow when working with small files
STORAGE						
Capacity	250GB	320GB	500GB	80GB	160GB	320GB
Formatted capacity (NTFS)	232GB	298GB	465GB	76GB	149GB	298GB
Price per gigabyte	£0.22	£0.19	£0.20	£0.46	£0.28	£0.20
Interface	UltraDMA 100	UltraDMA 100	UltraDMA 100	UltraDMA 100	UltraDMA 100	UltraDMA 100
Power connector	Molex	Molex	Molex	Molex	Molex	Molex
Spindle speed	7,200rpm	7,200rpm	7,200rpm	7,200rpm	7,200rpm	7,200rpm
Cache	16MB	16MB	16MB	8MB	2MB	2MB
Quoted seek time	12.0ms	8.9ms	8.9ms	10.9ms	8.9ms	8.9ms
HD Tach access time	15.3ms	14.9ms	15.0ms	13.7ms	13.4ms	13.2ms
Platters	2	2	1	1	2	3
Heads	3	4	6	2	4	6
Bearing technology	Fluid dynamic	Fluid dynamic	Fluid dynamic	Fluid dynamic	Fluid dynamic	Fluid dynamic
Noise level when idle	30dB(A)	34dB(A)	37dB(A)	38dB(A)	26dB(A)	34dB(A)
BUYING INFORMATION						
Price including VAT	£51	£58	£94	£35	£41	£61
Warranty	Five years	Five years	Five years	Three years	Three years	Three years
Supplier	www.yoyotech.co.uk	www.yoyotech.co.uk	www.ebuyer.com	www.yoyotech.co.uk	www.lambda-tek.com	www.ebuyer.com
Details	www.seagate.com	www.seagate.com	www.seagate.com	www.westerndigital.com	www.westerndigital.com	www.westerndigital.com
Part code	ST3250620A	ST3320620A	ST3500630A	WD800JB	WD1600BB	WD3200BB-00KEA0
     						

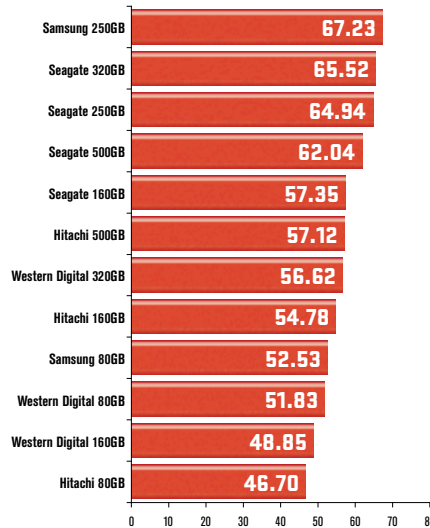
BENCHMARKS

Performance PATA internal hard disks

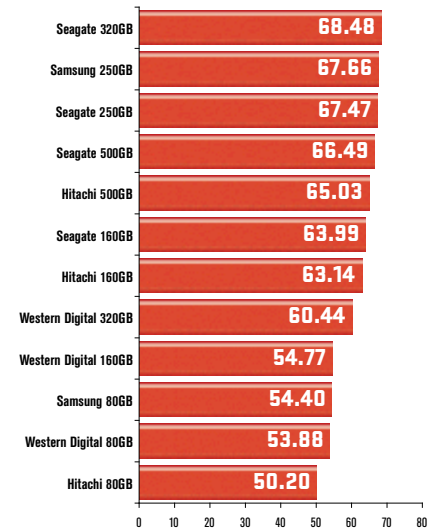
Read Large Files (MB/s)



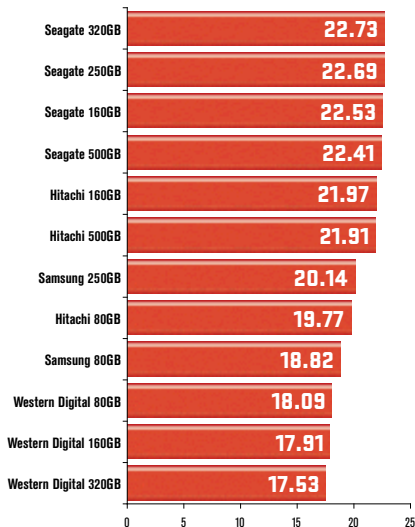
Write Large Files (MB/s)



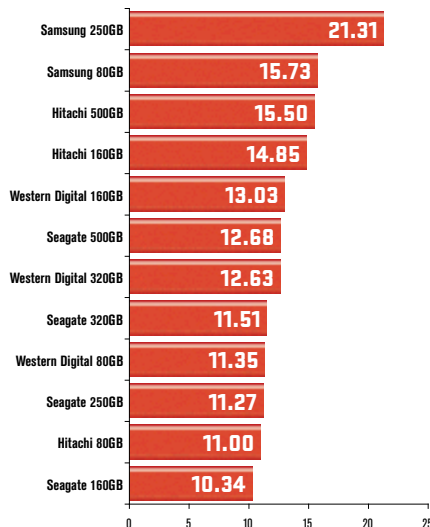
Large Files Overall (MB/s)



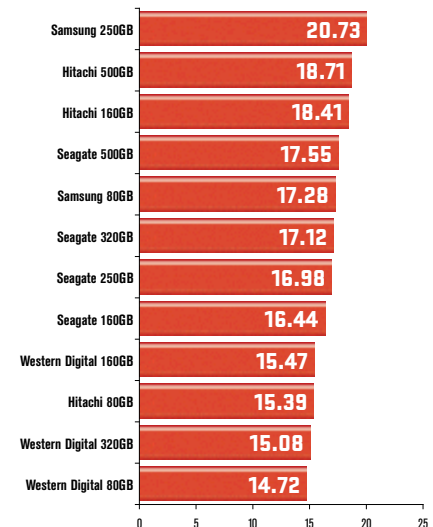
Read Small Files (MB/s)



Write Small Files (MB/s)



Small Files Overall (MB/s)



Labs verdict PATA hard disks

Hard disk and motherboard manufacturers are gradually phasing out the Parallel ATA, or PATA, interface in favour of Serial ATA (SATA). SATA disks are generally faster and their thinner cables make them easier to install. If your computer doesn't have any SATA ports, though, there's still a wide variety of PATA hard disks to choose from, and many are both quick and affordable.

80GB hard disks, such as those we reviewed made by Hitachi, Samsung and Western Digital, are still available. Unless you have the tightest of budgets, though, we wouldn't recommend buying them. All three have a high cost per gigabyte of storage, and none performed well in our file-transfer tests. Despite being cheap to buy, they're poor value.

By spending a little more, you can get a lot more storage space from a disk that's much better value. Seagate's 320GB

Barracuda 7200.10 is particularly cheap, with each gigabyte of its storage costing just 19p. It's quick when working with large files, too. Unfortunately, it was not quite as impressive when transferring small files, but it's still good value and a good buy if you want to store large media files rather than backups.

Samsung's SpinPoint P120-SP2514N is an even better disk. It's not quite as cheap, with its £49 price working out at 21p per gigabyte, but it performed very well in our file-transfer tests. In fact, it was the fastest PATA disk overall when working with small files of the type you'd transfer during a backup. With a good price, good value and an impressive turn of speed, it's our Budget Buy.

If you want to store loads of files on a single disk, though, you should look at one of the larger models. Hitachi's roomy 500GB Deskstar T7K500 did well in all our tests, and was especially good at writing small files.



SAMSUNG SpinPoint P120-SP2514N



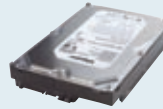
SEAGATE Barracuda 7200.10 Ultra ATA/100 500-GB Hard Drive



Unfortunately, it's not particularly good value. At 25p per gigabyte, it's a little on the pricy side. If you need this kind of high-capacity disk, Seagate's 500GB Barracuda 7200.10 is the one to choose. It costs less than £100, with a price that works out at just 20p per gigabyte, but it was one of the fastest PATA disks in several of our tests. Overall, it's a speedy, spacious and inexpensive disk, and a worthy winner of our Best Buy award.

SATA HARD DISKS

BUDGET BUY

MANUFACTURER	HITACHI	HITACHI	HITACHI	MAXTOR	MAXTOR	SAMSUNG
Model	Deskstar T7K500 320GB	Deskstar T7K500 400GB	Deskstar T7K500 500GB	DiamondMax 21 SATA 250-GB Hard Drive	DiamondMax 21 SATA 320-GB Hard Drive	SpinPoint T166-HD321KJ
Rating	★★★	★★★★	★★	★★★	★★	★★★★★
Pros	Quick at reading and writing small files	Quick at reading and writing small files; low cost per gigabyte	Quick at reading and writing small files	Low purchase price; fast at reading large files	Low price per gigabyte	Very fast in all our tests; inexpensive
Cons	Average performance with large files	Slow when working with large files	High cost per gigabyte	Small files performance is unremarkable	Significantly slower than Samsung's SpinPoint T166-HD321KJ	None
STORAGE						
Capacity	320GB	400GB	500GB	250GB	320GB	320GB
Formatted capacity (NTFS)	298GB	372GB	465GB	232GB	298GB	298GB
Price per gigabyte	£0.21	£0.17	£0.26	£0.22	£0.19	£0.20
Interface	SATA 300	SATA 300	SATA 300	SATA 300	SATA 300	SATA 300
Power connectors	SATA, Molex	SATA, Molex	SATA, Molex	SATA	SATA	SATA
Spindle speed	7,200rpm	7,200rpm	7,200rpm	7,200rpm	7,200rpm	7,200rpm
Cache	16MB	16MB	16MB	8MB	8MB	16MB
Quoted seek time	8.5ms	8.5ms	8.5ms	8.9ms	8.9ms	8.9ms
HD Tach access time	13.0ms	13.0ms	13.5ms	13.2ms	13.3ms	13.9ms
Platters	2	3	3	2	2	2
Heads	4	6	6	3	4	4
Bearing technology	Fluid dynamic	Fluid dynamic	Fluid dynamic	Fluid dynamic	Fluid dynamic	Fluid dynamic
Noise level when idle	30dB(A)	30dB(A)	30dB(A)	29dB(A)	29dB(A)	27dB(A)
BUYING INFORMATION						
Price including VAT	£62	£63	£120	£50	£57	£60
Warranty	One year	One year	One year	Three years	Three years	Three years
Supplier	www.ebuyer.com	www.eclipsecomputers.com	www.lambda-tek.com	www.ebuyer.com	www.pcnexday.co.uk	www.scan.co.uk
Details	www.hitachigst.com	www.hitachigst.com	www.hitachigst.com	www.seagate.com/maxtor	www.seagate.com/maxtor	www.samsung.com
Part code	HDT725032VLA360	HDT725040VLA360	HDT725050VLA360	STM3250820AS	STM3320820AS	HD321KJ
     						

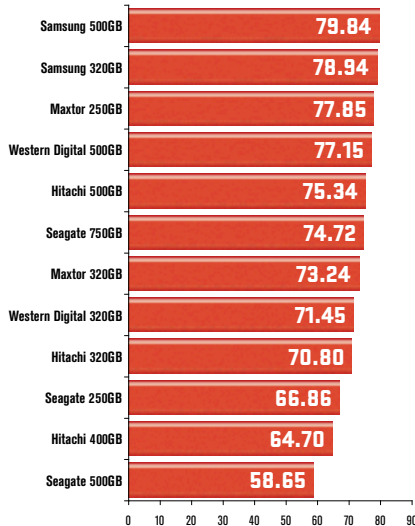
BEST BUY

MANUFACTURER	SAMSUNG	SEAGATE	SEAGATE	SEAGATE	WESTERN DIGITAL	WESTERN DIGITAL
Model	SpinPoint T166-HD501LJ	Barracuda 7200.10 SATA 3-Gb/s 250-GB Hard Drive	Barracuda 7200.10 SATA 3-Gb/s 500-GB Hard Drive	Barracuda 7200.10 SATA 3-Gb/s 750-GB Hard Drive	Caviar SE16 WD5000AAKS	Caviar SE WD3200AAJS
Rating	★★★★★	★★	★★	★★★	★★★	★★★
Pros	Fastest SATA disk in all our tests; low cost per gigabyte	Long warranty; quick at writing large files	Five-year warranty	Huge capacity; long warranty	Low cost per gigabyte; good with large files	Acceptable large file speeds
Cons	None	Otherwise disappointing performance	Generally slow; slightly expensive per gigabyte	High cost per gigabyte	Disappointing small files performance	Sluggish at writing small files; slightly high cost per gigabyte
STORAGE						
Capacity	500GB	250GB	500GB	750GB	500GB	320GB
Formatted capacity (NTFS)	465GB	232GB	465GB	698GB	465GB	298GB
Price per gigabyte	£0.19	£0.22	£0.23	£0.24	£0.19	£0.23
Interface	SATA 300	SATA 300	SATA 300	SATA 300	SATA 300	SATA 300
Power connectors	SATA	SATA	SATA	SATA	SATA	SATA
Spindle speed	7,200rpm	7,200rpm	7,200rpm	7,200rpm	7,200rpm	7,200rpm
Cache	16MB	16MB	16MB	16MB	16MB	8MB
Quoted seek time	8.9ms	10.0ms	10.0ms	12.0ms	8.9ms	8.9ms
HD Tach access time	14.0ms	13.1ms	13.1ms	13.5ms	13.6ms	13.4ms
Platters	3	2	3	4	3	2
Heads	6	3	6	8	6	4
Bearing technology	Fluid dynamic	Fluid dynamic	Fluid dynamic	Fluid dynamic	Fluid dynamic	Fluid dynamic
Noise level when idle	29dB(A)	30dB(A)	37dB(A)	32dB(A)	29dB(A)	27dB(A)
BUYING INFORMATION						
Price including VAT	£87	£52	£105	£167	£88	£68
Warranty	Three years	Five years	Five years	Five years	Three years	Three years
Supplier	www.scan.co.uk	www.dabs.com	www.lambda-tek.com	www.scan.co.uk	www.scan.co.uk	www.dabs.com
Details	www.samsung.com	www.seagate.com	www.seagate.com	www.seagate.com	www.westerndigital.com	www.westerndigital.com
Part code	HD501LJ	ST3250620AS	ST3500630AS	ST3750640AS	WD5000AAKS	WD3200AAJS
     						

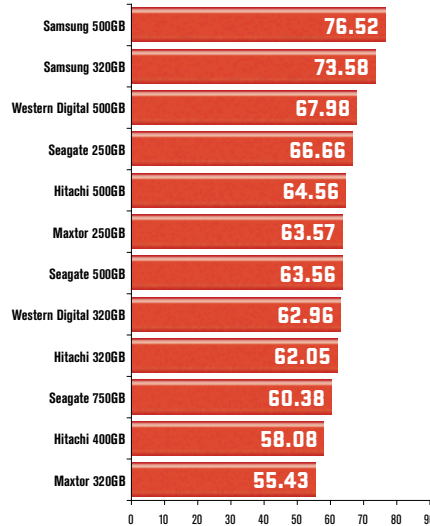
BENCHMARKS

Performance SATA internal hard disks

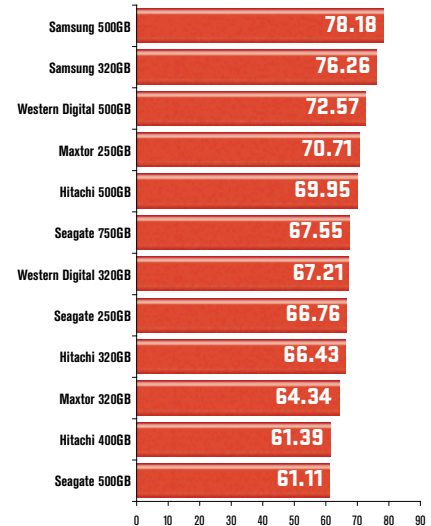
Read Large Files (MB/s)



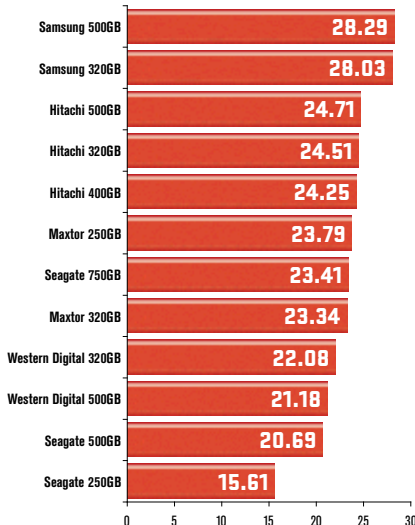
Write Large Files (MB/s)



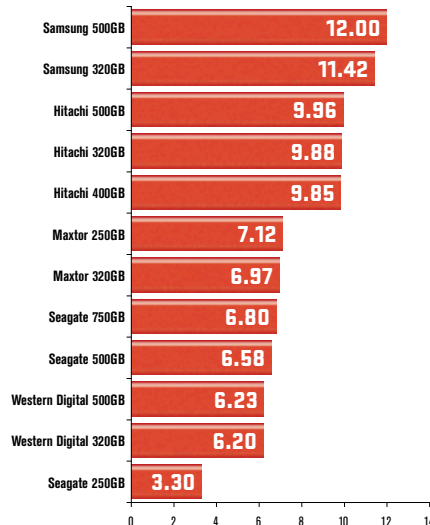
Large Files Overall (MB/s)



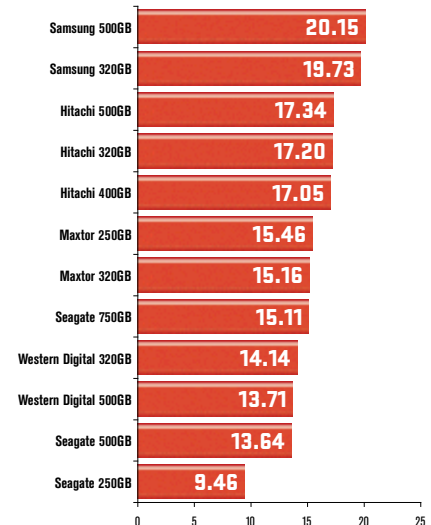
Read Small Files (MB/s)



Write Small Files (MB/s)



Small Files Overall (MB/s)



Labs verdict SATA hard disks

Almost all modern PCs use the Serial ATA, or SATA, standard for connecting internal hard disks. SATA hard disks can be cheaper than their PATA counterparts and the best SATA disks are generally faster than the PATA alternatives. Many of the SATA hard disks in this test performed well, but a few stand out as particularly impressive.

Seagate's 750GB Barracuda 7200.10 has the biggest capacity of any single hard disk we've seen and would provide plenty of space for all but the largest music and video collections. It's unsurprising that the largest disk should have the highest price, but at £167 it costs 24p per gigabyte, which is quite expensive. It didn't perform particularly well in our file-transfer tests, either.

Hitachi's 400GB Deskstar T7K500 is better value. At £63 including VAT, it costs just 17p per gigabyte of storage, making it the cheapest disk per gigabyte in this test.

It was quick when reading and writing small files, but it was less impressive in our large file tests. It's not a good choice if you want to store large video files, but would be fine if you want a disk to store several backups that each comprise many small files.

The low prices of 250GB hard disks, such as Maxtor's £50 DiamondMax 21, are very attractive if you're on a tight budget. They aren't always good value, though. The DiamondMax 21 costs 22p per gigabyte of storage, which isn't very cheap. Seagate's 250GB Barracuda also costs 22p per gigabyte, but larger 320GB disks are generally cheaper.

The two most impressive SATA hard disks in this group are made by Samsung. Samsung's 320GB HD321KJ was the second fastest SATA hard disk in all our tests, but costs a mere £60. At 20p per gigabyte, it's marginally more expensive than Maxtor's 320GB DiamondMax 21, but given the DiamondMax's inconsistent



SAMSUNG
SpinPoint
T166-HD321KJ
★★★★★



SAMSUNG
SpinPoint
T166-HD501LJ
★★★★★



performance the HD321KJ is the better deal. If you need a cheap, speedy hard disk the HD321KJ is a steal and it wins our Budget Buy award.

If you need more storage space and have a little more to spend, Samsung's 500GB HD501LJ is for you. At £87 including VAT, it's the cheapest of the 500GB hard disks in our round-up and costs just 19p per gigabyte. Better still, it was the fastest disk in every one of our transfer tests. It's our Best Buy.